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Assistant Commissioner for Patents, Washington, D.C. 20231.

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Drawing
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Igor Y. Khandros

Application No.: 09/245,499

Filing Date: February 5, 1999

For: AN ELECTRONIC ASSEMBLY HAVING A
SUBSTRATE WITH A PLURALITY OF
TERMINALS, AND A PLURALITY OF
ELONGATE SPRINGABLE
INTERCONNECTION ELEMENTS
CONNECTED TO THE TERMINALS

Examiner: K. Cuneo

Group Art Unit: 2841

TC 245,499-1001

AMENDMENT

2/6/01
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

In response to the Office Action dated October 6, 2000, the period for response to which ends on January 8, 2001 (the first business day after January 6, 2001), please amend the above-identified application as follows:

IN THE CLAIMS:

Please amend claims 113, 115, and 117 as follows:

113. (Amended) An electronic assembly comprising:

F1
a semiconductor die into which is integrated at least one electric circuit comprising a plurality of microelectronic components, said semiconductor die having a plurality of terminals;

and

✓
a plurality of resilient, springable, free-standing interconnection elements, each of the interconnection elements having a die end attached directly to a respective one of the terminals on the die, an elongate section between the die end and a contact end, and a tip on the contact end, the tip pointing away from the die.

115. (Amended) [The electronic assembly of claim 114 wherein] An electronic assembly comprising:

F2
a semiconductor die having a plurality of terminals; and

a plurality of resilient, springable, free-standing interconnection elements, each of the interconnection elements having a die end attached directly to a respective one of the terminals on the die, an elongate section between the die end and a contact end, and a tip on the contact end, the tip pointing away from the die, wherein the interconnection elements include a precursor element and an overcoat material covering said precursor element, the precursor element is of a flexible, substantially non-resilient material and the overcoat material provides the resilient springability of the interconnection element.

F3
117. (Amended) The electronic assembly of claim 113 wherein the elongate section includes at least one bend.

Please add new claims 124-131 as follows:

124. (New) An electronic assembly comprising:
a semiconductor die having a plurality of terminals; and
a plurality of resilient, springable, free-standing interconnection elements, each of the interconnection elements having a die end attached directly to a respective one of the terminals on the die, an elongate section between the die end and a contact end, and a tip on the contact end, wherein the interconnection elements include a precursor element and an overcoat material covering said precursor element, the precursor element is of a flexible, substantially non-resilient material and the overcoat material provides the resilient springability of the interconnection element.

125. (New) The electronic assembly of claim 124 wherein the precursor element includes a material selected from the group of gold, aluminum and copper, and the overcoat material includes material selected from the group of nickel, cobalt and iron.

126. (New) The electronic assembly of claim 124 wherein the elongate section includes at least one bend.

127. (New) The electronic assembly of claim 126 wherein the elongate section includes a proximate portion extending from said die end at an angle away from the die, a mid-portion extending at an angle from said proximate portion, and a distal portion extending at an angle from said mid-portion and away from the die.

128. (New) The electronic assembly of claim 127 wherein the proximate portion extends from the die end at an angle substantially perpendicular to the die.

129. The electronic assembly of claim 124 wherein the tip has a contact region which provides a releasable point contact.

130. The electronic assembly of claim 129 wherein the contact end is moveable toward the surface of the die upon the application of a downward pressure upon the tip.

131. The electronic assembly of claim 124 wherein the assembly further comprises a substrate having a plurality of contacts, and at least one of the interconnection elements conducts electricity when the tip of the interconnection elements is in releasable contact with a respective contact on the substrate.

REMARKS

Claims 113, and 115, and 117 have been amended, and claims 124-131 have been newly added. Claims 113-131 are pending in the application. In addition, proposed changes to the drawings marked in red are enclosed. Applicants respectfully request reexamination and reconsideration of the application.

The drawings have been objected to on the following grounds: (1) parts shown in section must be cross-hatched, and (2) Figure 1 should be labeled prior art. In response to the first ground of objection, Applicants submit herewith 13 sheets of drawings showing proposed changes marked in red to Figures 1-21. These proposed changes add cross hatching to each sectional view in the drawings, and accordingly, should overcome the first ground of objection. Applicants request that the Examiner approved these proposed changes.

In response to the second ground of rejection (that Figure 1 should be labeled prior art), Applicants propose labeling Figure 1a as prior art, as shown in the enclosed proposed drawing changes. With respect to Figure 1b, however, Applicants respectfully point out that Figure 1b illustrates a first step in an exemplary method of practicing the instant invention. In the exemplary first step of the exemplary method illustrated in Figure 1b, a wire skeleton is wire bonded to a contact pad and shaped to form the under-material of a resilient spring. (Specification, pp. 19-21.) In a subsequent exemplary step, the wire skeleton is coated. (Specification, pp. 21-22.) Thus, Figure 1b illustrates an exemplary step in an exemplary method for practicing the instant invention. Accordingly, it would not be proper to label Figure 1b prior art. Therefore, Applicants respectfully request that the Examiner withdraw this objection to the drawings with respect to Figure 1b.

The Examiner also raises the concern that the drawings do not illustrate and the specification does not describe an embodiment of the invention as claimed. Applicants respectfully assert, however, that there are several exemplary examples of the invention as claimed illustrated in the drawings and described in the specification. By way of example only, Figure 8 illustrates an exemplary embodiment of the invention as claimed in even the more narrow of the pending claims. Therefore, Applicants respectfully request that the Examiner withdraw this objection to the drawings and the specification.

Applicants note with appreciation the Examiner's indication that claim 123 is allowable and that claims 115 and 116 would be allowable if rewritten in independent form. Applicants have done so and therefore submit that claims 115 and 116 are allowable.

Claims 113, 120, and 121 have been rejected as being anticipated by Goldman; claims 113 and 117-122 have been rejected as being anticipated by Ashby; and claims 113 and 114 have been rejected as being anticipated by Walraven. Applicants respectfully traverse these rejections.

Goldman discloses a method for precisely aligning a wire bonded connection to a mesa junction in mesa type semiconductor devices. (Goldman, col. 1, lines 14-20 and col. 2, lines 51-55.) The Goldman invention is said to promote high frequency operation of the semiconductor device. (Goldman, col. 1, lines 32-35.) Goldman does not, however, teach or suggest that the wire connections (Goldman, Figure 4, element 118) with the mesas (Goldman, Figure 4, element 117) are "resilient" or "springable" as required by claim 113 of the instant application. Therefore, Goldman does not anticipate or render obvious independent claim 113.

Goldman also fails to teach or suggest "a contact region which provides a releasable point contact" as required by dependent claims 120 and 122 of the instant application. Indeed, nothing in Goldman teaches or suggests that either end of the wire connections (Goldman,

Figure 4, element 118) are releasable. Therefore, dependent claims 120 and 122 further distinguishes over Goldman.

Turning next to the Ashby patent, that patent discloses beam leads for use in semiconductor devices. The beam leads are shaped to absorb stresses created during the process of bonding the leads to the semiconductor device, and the beam leads are soldered in two places to provide redundant contact points. (Ashby, col. 1, lines 48-72; col. 2, lines 1-6, and 65-69; and col. 3, lines 10-19.) As is the case with the Goldman patent, however, the Ashby patent fails to teach or suggest that its beam leads (Ashby, Figure 1, elements 26, 30, 32, and 40) are "resilient" or "springable" as required by claim 113 of the instant application. The shapes of these beam leads do not, by themselves, imply that the beam leads are resilient or springable. Ashby's complete lack of any teaching or suggestion that the beam leads are resilient or springable renders claim 113 of the instant application patentable over Ashby.

Like Goldman, Ashby also fails to teach or suggest "a contact region which provides a releasable point contact" as required by dependent claims 120 and 122 of the instant application. Again, nothing in Ashby teaches or suggests that the beam leads (Ashby, Figure 1, elements 26, 30, 32, 40) are releasable. Therefore, dependent claims 120 and 122 further distinguishes over Ashby.

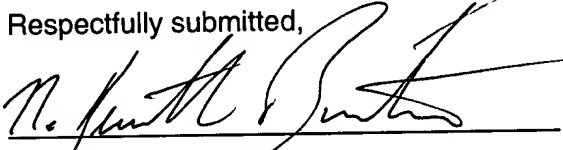
Walraven discloses a resilient contact element for use with a relatively large, discrete circuit element, such as a diode. The contact element includes a soft outer coating that is heated such that it makes an improved electrical contact with the diode. (Walraven, col. 1, lines 11-58; col. 2, lines 4-28.) In contrast to Walraven, the present invention is directed to spring-like electrical contacts that are formed onto a silicon die into which is integrated a microcircuit having a plurality of microcircuit elements. Walraven does not teach or suggest such a semiconductor die and, in fact, wholly fails to teach or suggest how or why one would go about

using its contact element to make an electrical connection with the miniature circuits that are integrated into semiconductor dies. Indeed, Walraven's disclosure regarding a contact element for a relatively large, discrete circuit element, such as a diode, is irrelevant to the instant invention's plurality of interconnection elements for use with miniature circuits integrated into a semiconductor die. Therefore, independent claim 113 distinguishes over Walraven.

In view of the foregoing, Applicants respectfully submit that all claims pending in the application patentably distinguish over the cited and applied references and are in condition for allowance. Reconsideration of the application is respectfully requested, and early allowance of the claims is solicited.

The Assistant Commissioner is hereby authorized to charge any fees that may be required by this transmittal and associated documents, or to credit any overpayment, to Deposit Account No. 50-0285.

Date: January 8, 2001

Respectfully submitted,
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